

National Earthquake Hazards Reduction Program

... a research and implementation partnership

Program Overview



**Presentation to NSTC SDR
5 November 2009**

Jack Hayes – NEHRP Director



FEMA

NIST
National Institute of
Standards and Technology



USGS
science for a changing world

national **earthquake** hazards reduction program

Presentation Outline

- Brief Program Overview
- Strategic Plan
- National Research Council Study
- George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES)

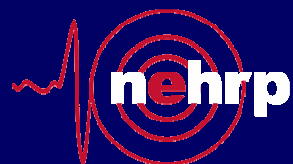
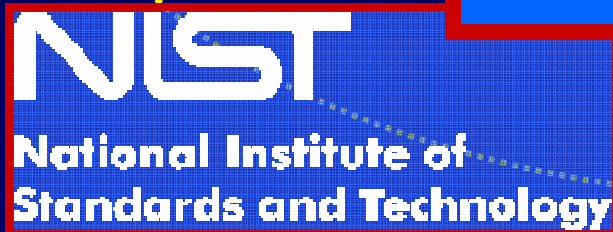
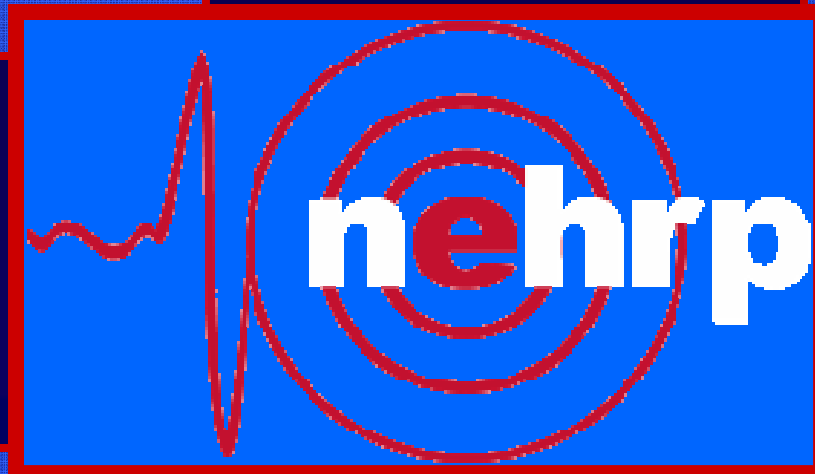
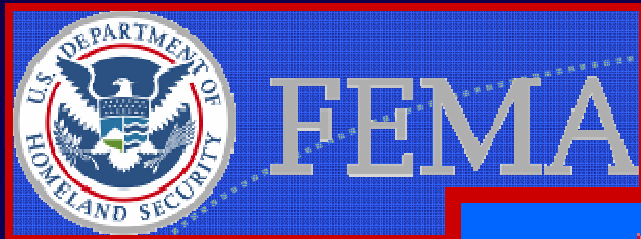
More information may be found at www.nehrp.gov !



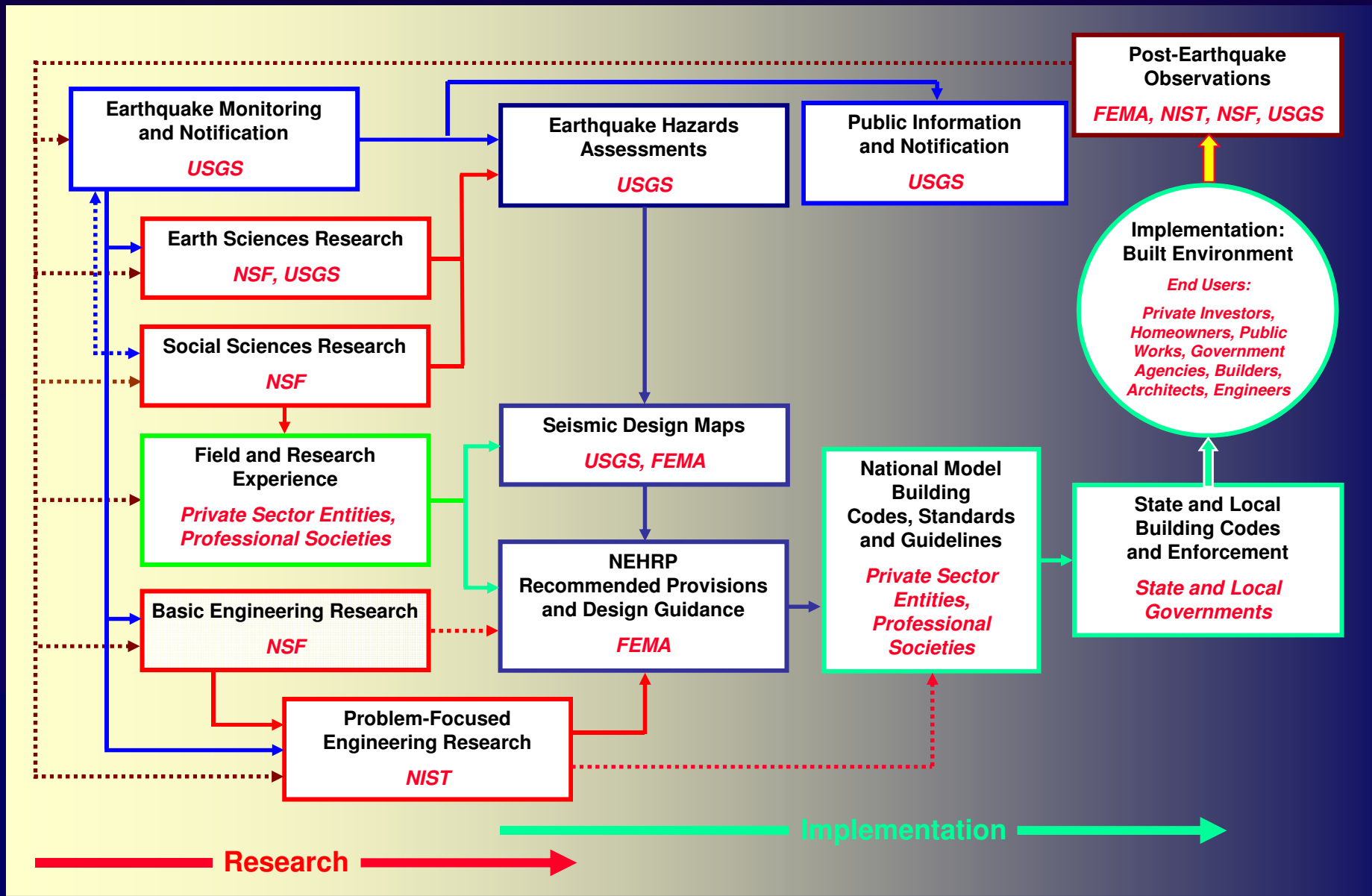
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National Earthquake Hazards Reduction Program

A Statutory Multi-Agency Partnership



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NEHRP Impact on the Built Environment

national earthquake hazards reduction program

Leadership and Oversight

- Statutory requirements:
 - Interagency Coordinating Committee (ICC) – heads of NEHRP agencies, OMB, OSTP
 - Advisory Committee on Earthquake Hazard Reduction (ACEHR)*
- Working level: Program Coordination Working Group (PCWG)

** Next ACEHR meeting will be at NSF on 23-24 Nov 09!*

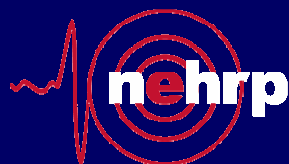


NEHRP Program Budgets

Agency	\$M											
	FY 2005		FY 2006		FY 2007		FY 2008		FY 2009		FY 2010	
	Authorized ¹	Enacted ²	Authorized ¹	Enacted ²	Authorized ¹	Enacted ²	Authorized ¹	Enacted ²	Authorized ¹	Enacted ²	Authorized ¹	Requested ³
FEMA ⁴	21.0	14.7	21.6	9.5	22.3	7.2	23.0	6.1	23.6	9.1	TBD	9.1
NIST ⁵	10.0	0.9	11.0	0.9	12.1	1.7	13.3	1.7	14.6	4.1	TBD	4.1
NSF ⁶	58.0	53.1	59.5	53.8	61.2	54.2	62.9	55.6	64.7	55.3	TBD	57.0
USGS ⁷	77.0	58.4	84.4	54.5	85.9	55.4	87.4	58.1	88.9	61.2	TBD	61.5
Totals	166.0	127.1	176.5	118.7	181.5	118.5	186.6	121.5	191.8	129.7	TBD	131.7

Notes:

- Budgets through FY 2009 authorized by Congress in Public Law 108-360. FY 2010 budgets to be determined in new authorization.
- “Enacted” budgets reported by NEHRP agencies for FY 2005 – FY 2009.
- “Requested” budgets for NEHRP agencies in President’s FY 2010 Budget Request, except for FEMA.
FEMA FY 2010 “requested” budget is estimated portion of President’s FY 2010 DHS budget request that will be allocated for FEMA NEHRP activities.
- FEMA FY 2005 enacted budget covered program activities and S&E, but excluded state grants.
FEMA FY 2006 – FY 2009 enacted budgets covered program activities, but excluded S&E and state grants.
- NIST budgets support NEHRP Secretariat and NIST Earthquake Risk Mitigation R&D Program.
- NSF budgets include NEES O&M funds: FY 2005 -\$17.9M, FY 2006 - \$20.3M, FY 2007 - \$20.5M, FY 2008 - \$22.1M, FY 2009 - \$20.8M, FY 2010 - \$23.9M.
- USGS authorization includes for ANSS: FY 2005 - \$30M, FY 2006 and beyond - \$36M per year.
USGS FY 2005 enacted budget includes funds for tsunami warning from emergency supplemental appropriation (\$3.95M for EHP, \$4.15M for GSN).
USGS budgets include GSN funds: FY 2005 - \$7.5M, FY 2006 - \$3.9M, FY 2007 - \$3.9M, FY 2008 - \$4.4M, FY 2009 - \$5.5M, FY 2010 - \$5.5M.



Legislative Update

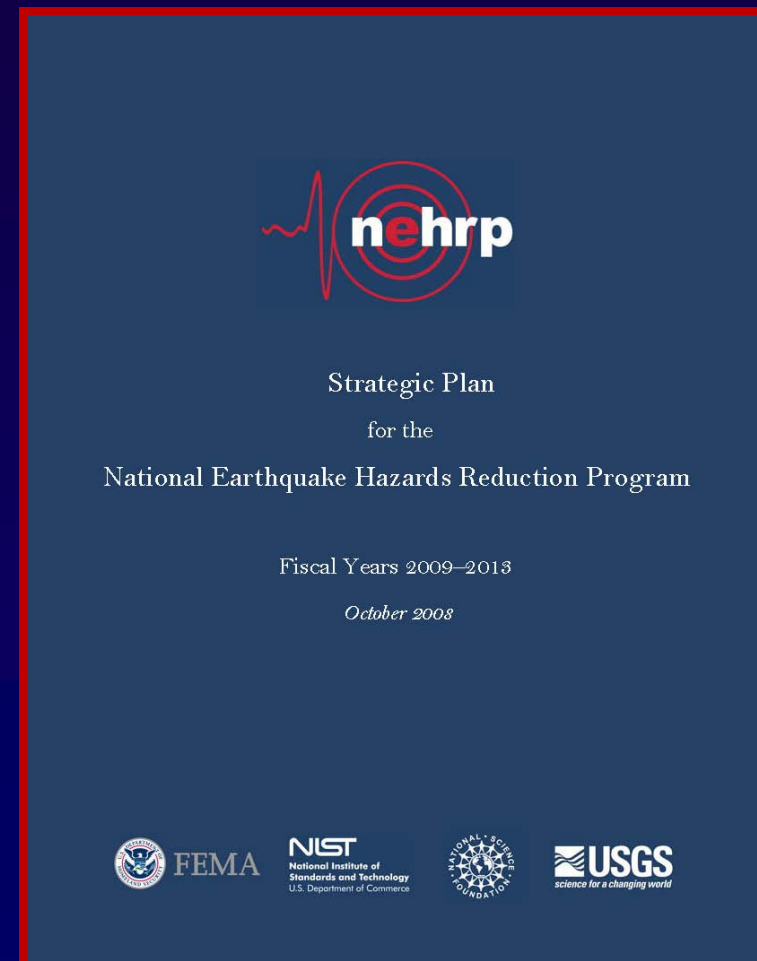
- House and Senate are currently drafting new reauthorization legislation, to be effective in FY 2010.
 - Reauthorization hearings in House Science & Technology (S&T) Committee were held on 11 June 2009 - Link to hearing video is available at NEHRP web site.
 - House S&T Committee has expressed interest in multi-hazard approaches.



Strategic Plan

Outline

- Executive Summary
- Introduction – Background (History, Prior Accomplishments)
- **Vision / Mission / Strategic Planning Principles**
- **Goals / Objectives / Outcomes**
- **Strategic Priorities**
- Summary
- Appendices



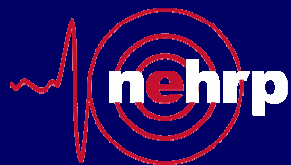
NEHRP Strategic Plan

National Vision Statement

The Program is driven by a national vision for the future:

*A nation that is earthquake-resilient
in public safety, economic strength, and national
security.*

This vision gives rise to the NEHRP Mission Statement (see next slide).



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NEHRP Strategic Plan

NEHRP Mission Statement

To develop, disseminate, and promote knowledge, tools, and practices for earthquake risk reduction – through coordinated, multi-disciplinary partnerships among the NEHRP agencies and their stakeholders – that improve the nation’s earthquake resilience in public safety, economic strength and national security.



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Strategic Goals

- A. Improve understanding of earthquake processes and impacts.
- B. Develop cost-effective measures to reduce earthquake impacts on individuals, the built environment, and society-at-large.
- C. Improve the earthquake resilience of communities nationwide.

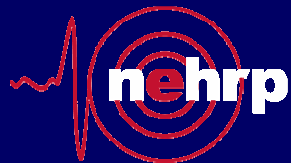
Goals closely parallel three major statutory program activities.



Strategic Planning Principles

... including ...

- Program impact through effective development and transfer of knowledge, tools, and practices
- Program revision – not reinvention
- Interagency coordination / cooperation / synergy
 - Includes coordinated budget development
 - Emphasizes that progress towards all Plan goals and objectives presented in this Plan will be made, but not all of the outcomes will be fully realized during the Plan period of 2008 – 2012
- Adoption of nine Strategic Priorities that support Program goals and objectives



Strategic Planning Principles (cont'd)

- Close partnerships with stakeholder communities
- Exploitation of ANSS, GSN, IRIS, **NEES**
 - Includes emphasis on instrumentation and facility utilization by program
 - Includes recurring support for operating key research and data collection facilities (e.g. ANSS, NEES), providing the necessary foundation for achieving Plan goals and objectives
- Multi-disciplinary approach
- **Multi-hazard leveraging awareness**
- **Linkages with broader federal policies, plans, and activities (e.g. SDR *Grand Challenges for Disaster Reduction*)**
- Increased international cooperation



Strategic Plan Structure

- NEHRP goals:

Broad and long-term with expected impacts that should be realized, in full or in part, during the five year planning period; serve to guide and focus NEHRP planning and activities to accomplish the NEHRP Mission.

- NEHRP objectives:

Specific achievements towards broad goals, with expected outputs and outcomes, that should be realized, in full or in part, during the five year planning period.

Note:

1. Fulfilling many of the objectives will contribute to more than one goal. Objectives are listed under the goal to which they principally contribute.
2. Statute also requires an Implementation Plan, which will contain more agency-specific data. That plan will be developed following Strategic Plan completion.



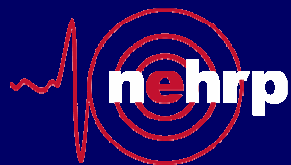
Goal A: Improve understanding of earthquake processes and impacts

- Objective 1: Advance understanding of **earthquake phenomena and generation processes**
- Objective 2: Advance understanding of **earthquake effects** on the built environment
- Objective 3: Advance understanding of **social, psychological, and economic factors** linked to implementing risk reduction and mitigation strategies in the public and private sectors
- Objective 4: Improve **post-earthquake information management**



Goal B: Develop cost-effective measures to reduce earthquake impacts on individuals, the built environment, and society at large.

- Objective 5: **Assess earthquake hazards** for research and practical application
- Objective 6: Develop **advanced loss estimation and risk assessment tools**
- Objective 7: Develop tools to improve the seismic performance of **buildings and other structures**
- Objective 8: Develop tools to improve the seismic performance of **critical infrastructure**



Goal C: Improve the earthquake resilience of communities nationwide

- Objective 9: Improve the accuracy, timeliness, and content of **earthquake information products**
- Objective 10: Develop comprehensive **earthquake scenarios and risk assessments**
- Objective 11: Support development of **seismic standards and building codes** and advocate their adoption and enforcement



Goal C: Improve the earthquake resilience of communities nationwide (continued)

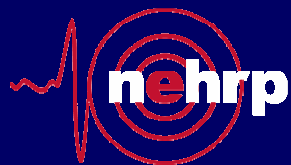
- Objective 12: **Promote the implementation** of earthquake-resilient measures in professional practice and in private and public policies
- Objective 13: Increase **public awareness** of earthquake hazards and risks
- Objective 14: Develop the nation's **human resource base** in earthquake safety fields



Strategic Priorities

Describes 2006 ICC examination of “gaps” & emphasizes 9 strategic priorities (presented in order of first association with goals and objectives):

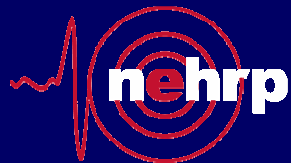
- Fully implement **Advanced National Seismic System (ANSS)**
- Improve techniques for evaluating & rehabilitating **existing buildings**
- Further develop **Performance-Based Seismic Design (PBSD)**
- Increase consideration of **socio-economic issues** related to hazard mitigation implementation



Strategic Priorities (continued)

Describes 2006 ICC examination of “gaps” & emphasizes 9 strategic priorities (presented in order of first association with goals and objectives):

- Develop a **Post-Earthquake Information Management System** (PIMS)
- Develop **advanced risk mitigation technologies & practices**
- Develop earthquake-resilient **lifeline** components and systems
- Develop & conduct earthquake **scenarios** for effective earthquake risk mitigation
- Facilitate improved earthquake mitigation at **state & local** levels



National Research Council Study

Background: 2003 EERI Report

- Developed 20-yr research & outreach plan for earthquake engineering
- Provided broad discussion of national needs, listing of broad task/activity areas, & rough estimate of costs for tasks/activities

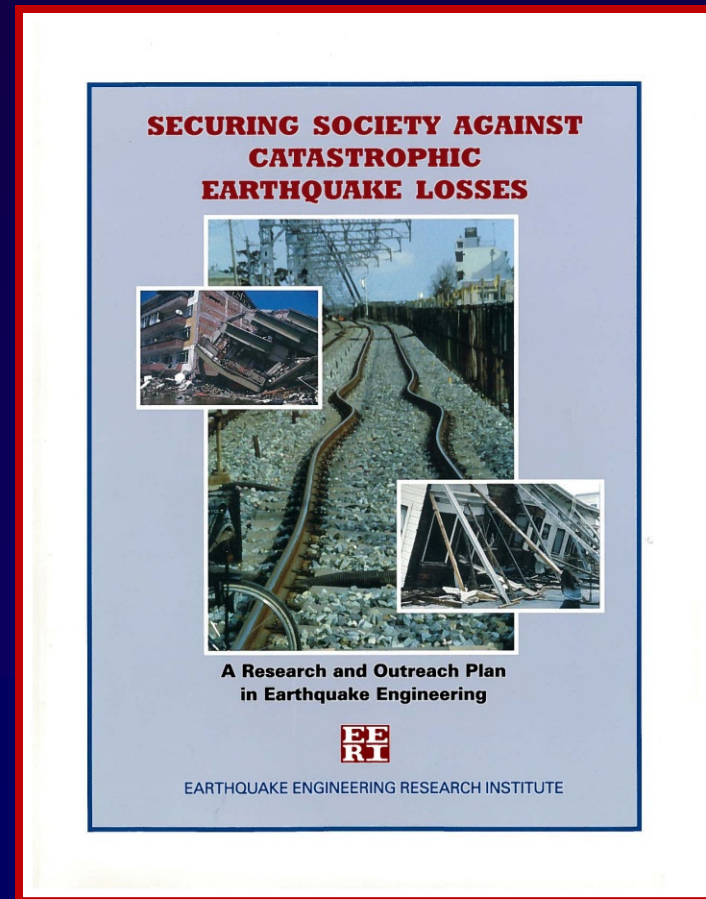
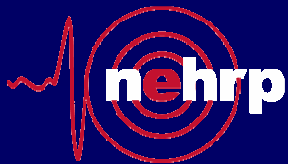


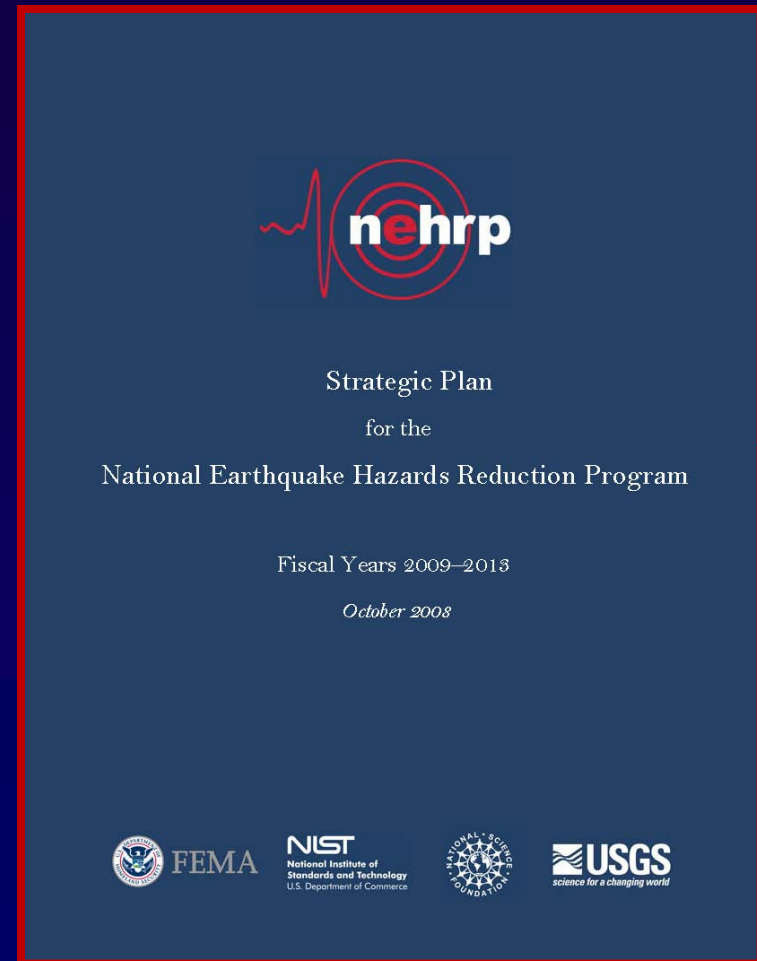
Figure courtesy of EERI



NRC Study

Post-2003

- Advances have occurred in the earthquake field, *e.g.*:
 - ANSS
 - NEES
 - EERC graduations
 - Technological advances
- Pace of change may not have matched that envisioned in the 2003 EERI report
- Costs have changed
- New NEHRP Strategic Plan was produced and has been seen by earthquake professionals as addressing national needs



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NRC Study

NEHRP Agencies' Premise for Study

NEHRP Strategic Plan sets:

- Appropriate national vision
- Sound philosophical approach to earthquake research, implementation & outreach
- Appropriate strategic goals, objectives, outcomes, and priorities



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NEHRP Agencies' Purpose for Study

- Provide an independent technical roadmap (with validated current costs) to implement strategic goals, objectives, outcomes, and priorities identified in NEHRP Strategic Plan.
- The roadmap will be used by NEHRP agencies as an informational reference document in program planning.
- The roadmap is not intended to:
 - Identify new or different goals or objectives for earthquake risk reduction; these have already been identified in the Strategic Plan.
 - To be tied to planned or future NEHRP agency budgets, budget requests, authorizations, or appropriations.



NRC Study

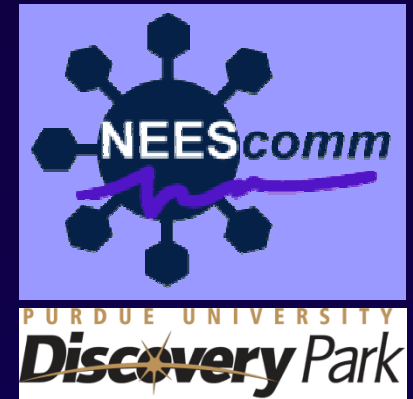
Current Status

- Contract awarded in September 2008
- Project technical committee formed in early 2009
- Agencies met with committee in May 2009
- National workshop conducted at UC Irvine in August 2009
- Committee met in closed session in October 2009
- Committee slated to meet with Agencies in December 2009
- Final report due in mid-2010



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George E. Brown, Jr. Network for Earthquake Engineering Simulation

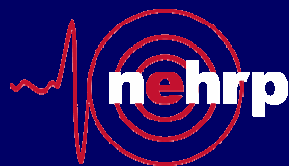


Major Components

- Equipment site operations & maintenance
- Requirements-driven Cyberinfrastructure-*NEEShub*
- Engineering education excellence-*NEES Academy*
- Engaged global multi-hazard *NEES Community* and a Community Forum



NEES Slides & Info Courtesy of Prof Julio Ramirez, Purdue University

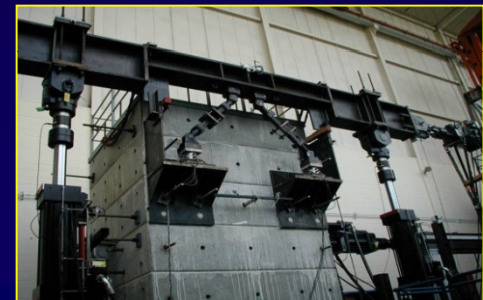


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George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES)

Equipment Sites

- Geotechnical Centrifuges (3)
- Shake Table Facilities (3)
- Structural Laboratories (4)
- Mobile Experimental Facilities (2)
- Permanent Field Installation
- Tsunami Wave Basin



Oregon State University

University of Illinois
Urbana-Champaign

University of Minnesota

University of California
Berkeley

University at Buffalo

University of California
Davis

Cornell University

University of California
Santa Barbara

Rensselaer Polytechnic Institute

University of California
Los Angeles

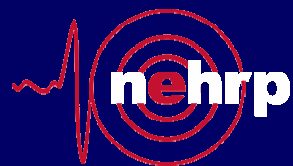
Lehigh University

University of California
San Diego

University of Nevada
Reno

University of Texas
Austin

NEES



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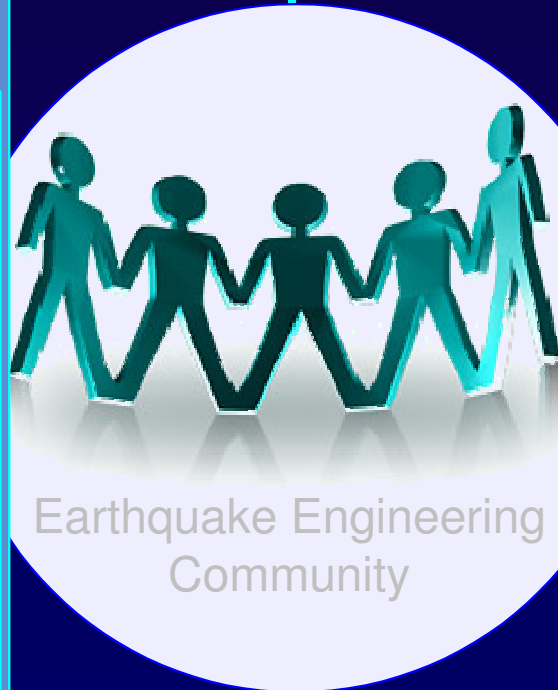
NEES

Production-Quality Cyberinfrastructure

An integration framework for

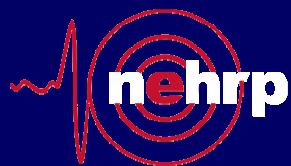
Equipment @ 14 NEES Sites

The screenshot shows a software interface with a 'Loading Parameters' section on the left, including 'Desired Frequency' and 'Number of Cycles'. A central graph displays a waveform. Below the graph is a 'Waveform Information' section. At the bottom, there is a live video feed from an 'AXIS 210 Network Camera' showing a large industrial testing rig in a laboratory setting.



Community IT Tools

The screenshot shows the 'NEEShub' website header with navigation links. Below it is the 'N3DV' software interface. The interface includes a 'Nodes' list on the right with items like NEM10, NEM11, NEM12, NEM13, NEM14, NEM15, NEM16, NEM17, NEM18, NEM19, NEM20, NEM21, CVM1, CVM2, SEM1, and SEM2. The main area displays a 3D model of a testing rig with various colored markers. Below the model is a 'Time Sensor' section with a play button and a timeline graph showing data over 5000 frames.



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NEES

Cyberinfrastructure-NEEShub

NEEShub

Home my HUB Resources About Research Sites

1 2 3 4 5 6 7 8 9

Earthquake Engineering
Rensselaer Polytechnic Institute

View Activities Map

more

Share Experiment data

- Access available data
- Contribute data

Featured Tools

- inDEED: View earthquake experiment data.
- Earthquake Simulator

Run Numerical Simulators

- Simulation Tools
- Contribute a Simulator

Access Remote Instruments

- See Remote Labs on Web-car

NEES Academy

- Learn with Online Tools
- Access Remote Labs with Teaching Facilities
- Conferences and Workshops

Office Tools

- OpenOffice
- PDF Viewer



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NEES

Connecting Sites into a Global Network

